

Passive Solar Energy

If you are thinking about buying a new home or about renovating your present one — think “passive solar.” Current fuel supply uncertainties, escalating costs of conventional fuels, and new developments in the passive solar field are making the passive solar alternative an increasingly attractive option.

Solar energy systems are of two basic types, active and passive.



Active systems use a variety of mechanical components including collector panels, fans, pumps and other hardware.

Passive systems utilize building design and arrangement of components to collect, store and transfer solar heat.

If you've ever sat in a car on a sunny day with the windows rolled up you've become intimately aware of the “greenhouse effect” and experienced passive solar heating. As short wave solar radiation passes through the glass it is absorbed by the darker materials in the car and turned into long wave heat energy. As glass prevents the long wave radiation from passing back to the outside, the temperature rises. Solar energy has been transmitted through and trapped by the windows. Similarly in a residential passive solar energy system, the structure of the house itself acts as a solar collector.

Passive Techniques

Passive space conditioning techniques are perhaps the most cost-effective way to realize the potential of solar energy.

The location and size of windows are important. Double-glazed, south-facing windows are most useful for solar heating. The amount of glass on the north side should be minimized as it receives no usable direct solar energy during the winter.

As solar energy passes through the south windows of a house, inside surfaces exposed to direct sunlight are heated first. Energy from these surfaces can then be transferred to other materials and the rest of the house.

The interior building materials must be able to absorb and store heat and release it slowly into the interior as it is needed. This is the concept of



“heat capacity.” In some systems additional storage materials are added to increase the heat storage capacity.

The materials most widely used to provide heat capacity are concrete, brick, and water.

Today's passive applications are of three general types: direct gain, thermal storage walls and attached sunspaces.

Direct Gain

The direct gain method simply uses south-facing windows with considerable heat capacity on the inside of the building. Winter sunlight passing through the glass heats the walls and floor.

Thermal Storage Walls

This approach calls for a large, masonry wall painted a dark colour (or water-filled containers located behind the glass panels on the south side of the building).

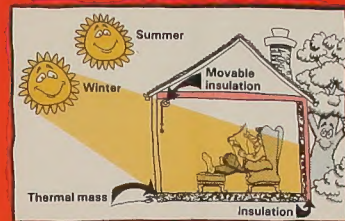
As solar energy passes through the glass, the masonry wall absorbs and stores solar heat directly, transferring it indoors at night or when the sun is not shining.

Attached Sunspaces

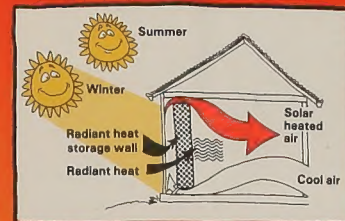
A sunspace built on the south face of a building is a way to add solar heat gain to an older structure, or to incorporate it into a new building.

Sunspaces should face south for maximum exposure to the sun. Windows or vents at the upper and lower parts of the wall between the building and the sunspace allow circulation of fresh, warm air.

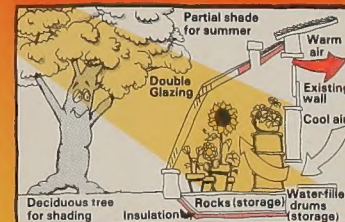
A solar sunspace can create an attractive border between the living space and outdoors. It also establishes a thermal “buffer zone” to substantially reduce heat losses.



The direct gain building, a live-in solar collector.



Thermal storage walls add warm air and radiant heat.



Example shows how sunspaces can add heat to the building.

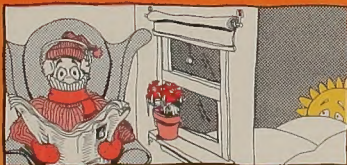
Keeping the Heat In

To keep the heat inside a building it is necessary to take steps to make it difficult for the heat to get out. The incorporation of basic energy conservation features that produce a well-insulated and well-sealed building shell are essential in reducing any building's heat losses.

Windows allow the sun to shine in, but they are also a major source of heat loss when the sun does not shine. Double-paned windows can cut outward heat losses from windows by up to 50%, while



When it's available, sunlight can heat your house . . .

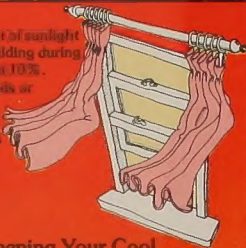


. . . but the heat can be lost through the windows when it's not.



Always close blinds or curtains at night.

reducing the amount of sunlight which enters the building during the day by only about 10%. Heavy curtains, blinds or shutters can decrease the heat losses from windows at night.



Keeping Your Cool

Vents and open windows, properly located, let in summer breezes for natural ventilation. Because of the tendency of warm air to rise, cooler air enters at ground level while warmer air is exhausted at the top.



The use of deciduous trees can provide shade during the summer while the bare branches allow the sun to pass through in the winter.

Light exterior colours reflect the sun's rays. This is especially important where summer cooling requires a large amount of energy.



A Word of Advice

Passive solar heating should not be considered in isolation from good energy conservation measures in new and existing houses.

Caution needs to be exercised in the design of houses using passive solar energy since the indiscriminate increase of glazing areas can result in severe overheating on sunny days and, conversely, higher heat losses at night. Advice should be sought from a qualified designer.



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Passive Solar Energy Let the Sunshine In

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